

# Impact Risk for 1 – 8 Year Old Children on the Struck Side in a Lateral Crash

Vinay Nagabhushana, Richard M. Morgan, Jason (Yong Seok) Park, and Alexander Kuznetsov

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## Outline

- Focuses on the lateral nearside crash environment that a child, 1 – 8 years old, experiences on the highway.
- A goal is to define the attributes that a sled test should possess to mimic the impact and structural response factors of child trauma in a side impact.
- Based on analysis of the National Automotive Sampling System: Crashworthiness Data System (NASS/CDS) for the years 1991-2005.
- Injury extent is evaluated using Harm, a social cost measure.

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## Data Set for Children 1 - 8 YO

### ➤ Inclusion

- ☐ NASS/CDS 1991-2005
- ☐ All Vehicle Model Years
- ☐ GAD = Left or Right Side
- ☐ Child occupant on Side of Impact – Struck Side
- ☐ Age 1 – 8-years old
- ☐ Occupant either restrained or unrestrained or unknown
- ☐ Child occupant in near side of Passenger Cars or LTV's Only

### ➤ Exclusion

- ☐ Rollovers
- ☐ Child Occupants in far side of passenger cars and LTV's

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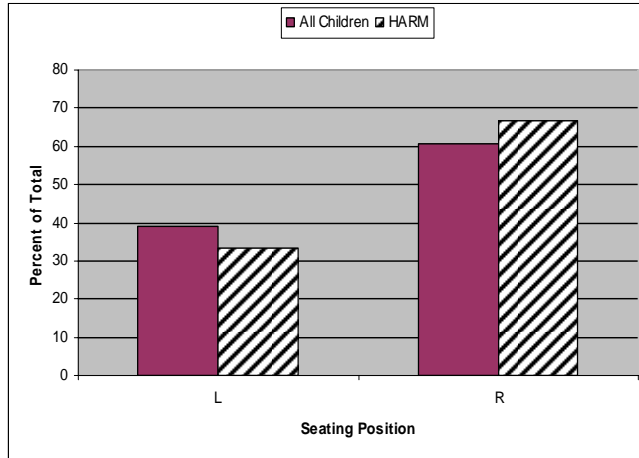
## Child Side Cases for 1-8 YO NASS 1991 - 2005

	<b>Weighted</b>	<b>Un-weighted</b>
<b>Occupants</b>	<b>148,768</b>	<b>489</b>
<b>MAIS ≥ 3 Occupants</b>	†	<b>84</b>
<b>Fatalities</b>	†	<b>23</b>
<b>Harm<sub>norm</sub></b>	<b>5,690</b>	

† No calculation of a National Estimate was attempted because the sample size was thought to be too small.



## Weighted Distribution by Left or Right Side Seating Position



61% of children seated on Right Side of struck vehicle  
(67% of HARM)

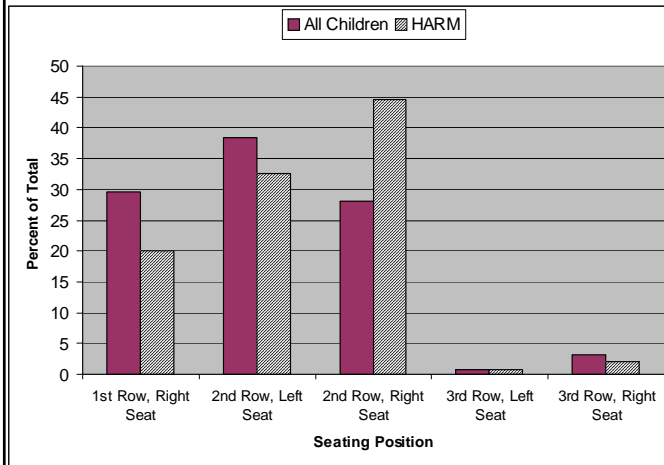
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## Weighted Distribution of Child Occupants by Seating Row Position



66% of the children were seated in 2<sup>nd</sup> Row  
(77% of the HARM)

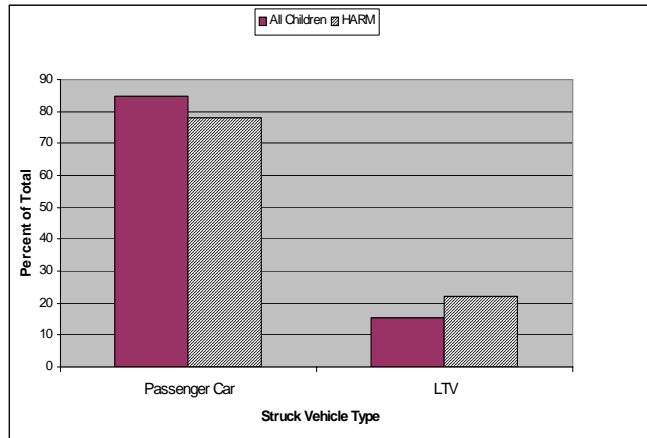
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## Weighted Distribution of Children and Harm by Body Type of Struck Vehicle



84% of the children were in struck side of Passenger Car  
(78% of the HARM)

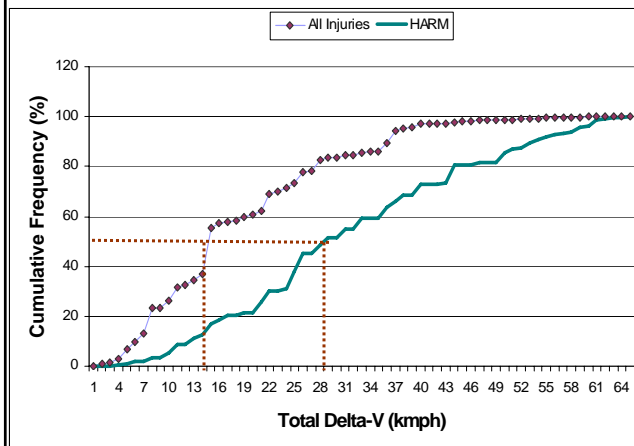
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## Cumulative Distribution of Total $\Delta V$ for Weighted All Crashes and for Child Harm



Up to 50% of crashes had total  $\Delta V \leq 15$  km/hr  
(Up to 50% of HARM occurred at total  $\Delta V \leq 29$  km/hr)

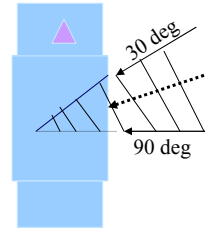
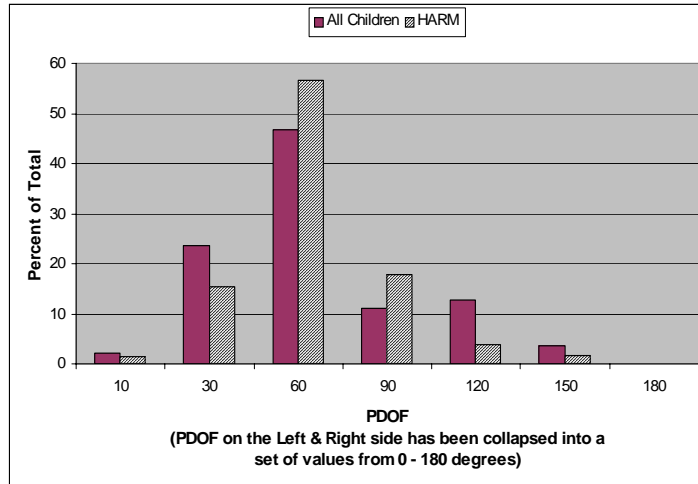
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## Weighted Distribution of Crash Direction of Force



90% of crash (30 deg to 90deg)

(56% of HARM occurred at 60 deg PDOF)

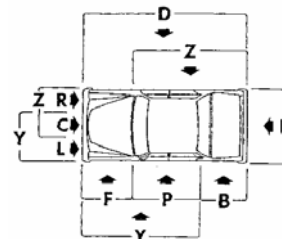
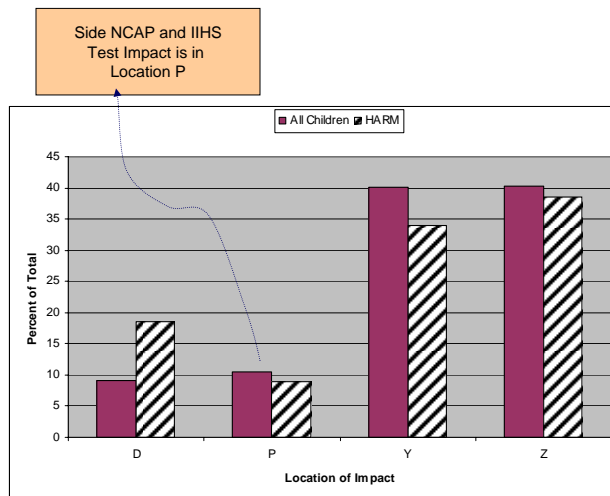
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## Weighted Frequency Distribution by Location of Impact



SAE J224 Protocol

80% of crashes had "Y" or "Z" type damage

(70% of HARM)

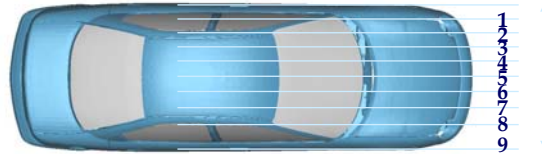
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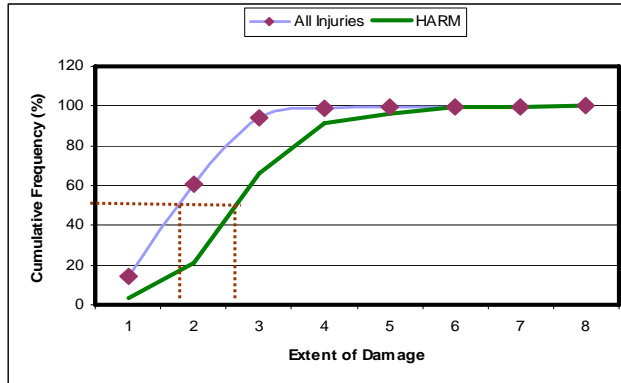
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## Weighted Cumulative Distribution of Extent of Damage for all Crashes and for Child Harm



SAE J224 Protocol



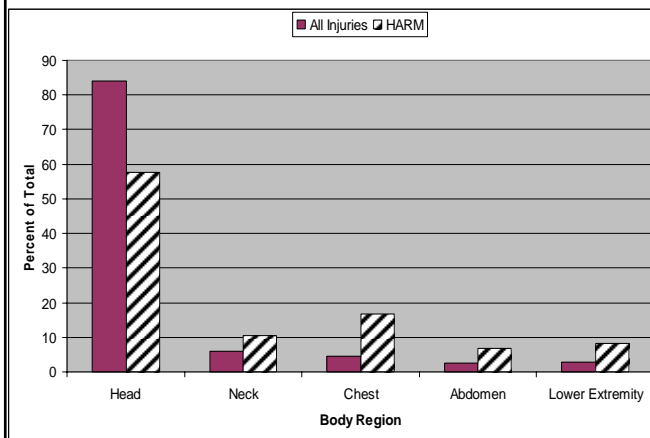
50% of all crashes had extent of damage up to 1.8  
(50% of HARM had Extent of Damage up to 2.6)



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## Weighted Distribution of Injured Body Regions and Harm by Body Region



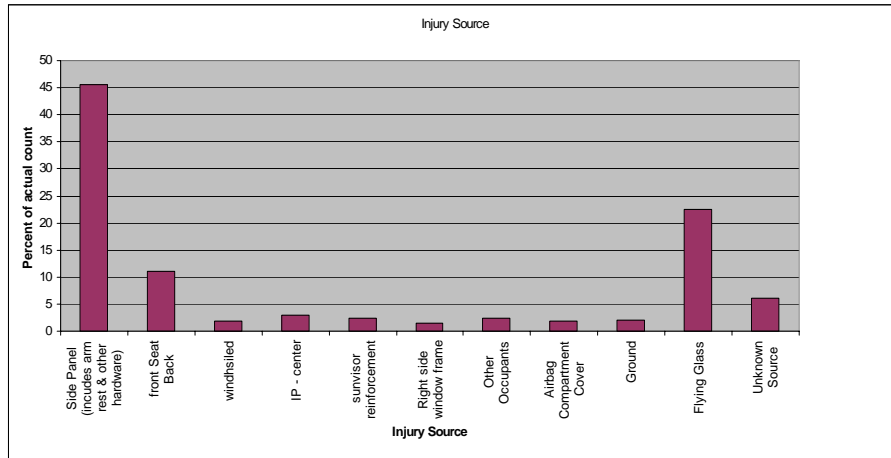
83% of all injuries were to head (and face)  
(58% of HARM)



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## Un-Weighted Distribution of “Head” Injury Contact Source



## Conclusions NASS 1991 - 2005

- A direction of impact force at 60 degrees (2 o'clock or 10 o'clock) was most likely to be that found in severe nearside crashes involving children 1 – 8 years old.
- In most of these crashes, the pattern of the side damage was distributed along the entire side. A direct thrust into the occupant compartment of the struck vehicle was not the common event.
- The Extent of Damage at the 50% level of Harm in NASS was about 2.6.
- Total  $\Delta V$  at the 50% level of Harm in NASS cases was 29 km/hr.
- Head injury dominated the injury outcome.

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